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| 10/813,543 | 03/30/2004 | F. Dan Gealy | MI22-3685 | 8087 |
| 21567 7590 04/09/2009 WELLS ST. JOHN P.S. 601 W. FIRST AVENUE, SUITE 1300 SPOKANE, WA 99201 | | | | |
| EXAMINER | | | | |
| CHEN, KEATH T | | | | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/813,543

Applicant(s)

GEALY ET AL.

Examiner

KEATH T. CHEN

Art Unit

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 February 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 70-81 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 70-81 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SE/US)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. Applicant's amendment, filed on 02/18/2009, in response to the rejection of claims 70-81 of the non-final office action mailed on 11/18/2008, by amending claims 70, 76, and 81 is acknowledged and will be addressed below.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. **Claims 70-71 and 73-77 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bennett et al. (US 5367139, hereafter '139), in view of Shinriki et al. (WO 02/15243, hereafter '243). (US 6806211, hereafter '211, is cited for corresponding English version of the '243).**

'139 teaches some limitations of:

Claim 70: An atomic layer deposition apparatus (Figs. 6 and 7, is capable of ALD) comprising: a chamber (#10, col. 9, lines 31-34) configured to receive substrate (wafer #32, col. 15, line 60) for deposition, the chamber having lateral inner walls (chamber wall #30, col. 15, line 52).

'139 further teaches a pulse generator #54 and power supplies #50-52 and, on the inner wall of the chamber, acoustic transducers/drivers #61 and #62 (col. 16, lines 18-29) which is also named piezoelectric transducers T #34 (col. 9, lines 17-19) in Fig. 1.

'139 does not explicitly teaches:

Claim 70: a piezoelectric liner extending substantially parallel to at least a portion of the one of the lateral inner walls, the liner being configured to be lateral of edges of the substrate upon receipt within the chamber; and at least a pair of acoustic wave drivers on the liner.

Claim 74: The apparatus of claim 70, wherein the piezoelectric liner is cylindrical.

Claim 75: The apparatus of claim 70, wherein the piezoelectric liner is a quartz liner.

'243 is an analogous art in the field of semiconductor processing (abstract), particularly in contamination (last paragraph of page 26, see also '211, col. 18, lines 48-52). '243 teaches quartz liners (Fig. 19, #202A-B, 2nd paragraph of page 26 or '211 col. 18, 2nd paragraph, and #201d, 2nd paragraph of page 27, or '211 col. 18, last paragraph), for the purpose of avoiding contamination (last paragraph of page 26 or '211, col. 18, lines 48-52). Note the liner #201d is extending substantially parallel to lateral inner wall (#201) and lateral of edges of substrate (W, see Fig. 19).

At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to have added quartz/piezoelectric liner, as taught by '243, to the apparatus in Figs. 6-7 of '139, for the purpose/motivation of avoiding contamination. This quartz/piezoelectric liner obvious would have to be cylindrical shape to fit over the inner wall of chamber #30 in Fig. 7 of '139. Furthermore, to have moved the acoustic wave driver #61 and #62 from the chamber wall onto the piezoelectric liner because it is

well-known in the art that the contamination will be formed on the liner instead of the chamber wall when liner is deployed. (Note this well-known fact is treated as admitted prior art, see MPEP 2144.03 B).

'139 further teaches the limitations of:

Claim 71: The apparatus of claim 70, wherein the acoustic wave driver (#61 and #62) is adapted to drive the surface acoustic wave in a selected range of frequencies (by using pulse generator #54, col. 16, lines 26-29; see also col. 11, lines 62-65).

Claim 73: The apparatus of claim 70, wherein the acoustic wave driver comprises at least one transducer (#61 or #62, col. 16, lines 18-21, see Applicants' specification, page 9, lines 13-14, acoustic wave drive is piezoelectric transducer).

Claim 76: The apparatus of claim 70, further comprising a pump (vacuum throat #31, col. 9, lines 31-34, see also col. 17, lines 58-61) coupled to the chamber (#10) and operable to evacuate a first precursor gas from the chamber (Fig. 4, SiF₄, col. 18, line 12; However, gas identity is intended use in the apparatus claim).

Claim 77: The apparatus of claim 70, wherein the chamber is adapted to receive a second precursor gas (NF₃ or CF₄, col. 17, line 49. However, gas identity is considered intended use).

3. Claims 72 and 78-81 are rejected under 35 U.S.C. 103(a) as being unpatentable over '139 and '243, in view of Koinuma et al. (US 5569502, hereafter '502).

'139 and '243, together, teach all limitations of claims 70-71, as discussed above. '139 further teaches the use of piezoelectric acoustic transducer (col. 9, lines 17-19) on the chamber wall to produce pressure wave (col. 11, lines 28-37) to reduce particle contamination, the frequency is chosen to minimize the transduction impedance and to maximize the getting of suspended particles (col. 11, lines 62-65) or the mass of particulates (col. 11, lines 23-27); or in using surface (col. 15, lines 18-21) acoustic wave in acoustic stress (col. 16, lines 14-32); and the surface acoustic wave and pressure wave can be combined (col. 17, lines 4-5); but is silent on the details of acoustic transducer design.

'139 does not teach the limitations of:

Claim 72: The apparatus of claim 71, wherein the selected range of frequencies is chosen from an overall range of about 100Hz to about 200 kHz.

Claim 78: The apparatus of claim 70, further comprising at least a pair of electrodes associated with at least one of the wave drivers.

Claim 79: The apparatus of claim 78, wherein one of the pair of electrodes is configured to operate at one polarity and the other of the pair of electrodes is configured to operate at another polarity opposite of the one polarity.

Claim 80: The apparatus of claim 78, wherein each of the electrodes comprises a conductive backbone having a plurality of conductive prongs extending therefrom.

Claim 81: The apparatus of claim 80, wherein each of the prongs of the electrodes defines a space therebetween and the pair of electrodes are aligned with

one another having prongs of one electrode within the space of the other and prongs of the other electrode within the space of the one.

'502 is an analogous art in the field of semiconductor (col. 5, lines 35-36) deposition (plasma CVD and PVD, col. 5, lines 27-32; '139, col. 13, lines 3-12), particularly in detail of generation of surface acoustic wave (col. 2, lines 18-26). '502 teaches a pair of comb-shaped opposite polarity electrodes (Fig. 3, #32 and #32' on opposite side of source #33, col. 6, lines 1-6) on piezoelectric (#31 made of lithium niobate, col. 6, lines 1-3, is a piezoelectric, col. 4, lines 58-59) with frequency from 0.1 to 1000 Hz (col. 7, lines 64-66) to provide a surface acoustic wave (col. 2, lines 18-26). Note the comb shape electrodes have conductive (intrinsic of electrode) backbone and prongs aligned and interleaved with each other.

At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to have adopted the comb-shaped electrode pair, as taught by '502, to the piezoelectric acoustic transducer (T #34 in Fig. 1 or #61-62 in Figs. 6-7) of '139, as a suitable design for the piezoelectric acoustic transducer. The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. MPEP 2144.07.

For claim 72, '139 discloses the claimed invention except for frequency range. It would have been obvious to a person having ordinary skill in the art at the time the

invention was made to optimize the frequency range, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). The frequency is a result effective variable as taught by '139 (col. 11, lines 62-65).

Response to Arguments

Applicant's arguments filed 02/18/2009 have been fully considered but they are not persuasive.

4. In regarding to 35 USC 112 rejection, Applicants argue that surface 185 is liner 200, and is "lateral of edges of the substrate" see the bottom of page 5 to top of page 6. The examiner considers the above statement along with the specification "The reactor chamber 105 includes one or more acoustic wave drivers 180 that are capable of driving acoustic waves along the surface 185 interior to the reactor chamber 105" at lines 21-22 of page 8 is convincing. The 35 USC 112 rejection is withdrawn.
5. In regarding to 35 USC 103 rejection, Applicants argue that liners #202A and #202B of Fig. 19 are not parallel of the lateral inner wall, see the second complete paragraph of page 6.

This argument is found not persuasive.

Liner #201d is parallel of the lateral inner wall. Note Liner #201 was also cited in the previous office action.

6. In regarding to various dependent claims, Applicants' arguments are based on the patentability of the parent claims. Since the parent claims are found not patentable, all dependent claims are not patentable.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEATH T. CHEN whose telephone number is (571)270-1870. The examiner can normally be reached on 6:30AM-3 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. T. C./
Examiner, Art Unit 1792

/Michael Cleveland/
Supervisory Patent Examiner, Art Unit 1792